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TWICE MONTHLY
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SECOND ISSUE
•
NOVEMBER 1959

2nd Year
Vol. 52
No. 22

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CALIFORNIA
OIL WORLD
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Energy and Public Affairs

Address of HERBERT HOOVER, Jr., November 4, 1959
Columbia University Symposium on Energy

It is indeed an honor to participate in this centennial celebration of the founding of the petroleum industry. Oil has become one of our greatest sources of energy—and with it has come a revolution in American life and living.

When Drake completed his first well, just a short distance from here, he could not possibly have guessed at the forces he was setting in motion or at the events that would follow. When his well came in from a depth of less than a hundred feet, he could not have dreamed that a hundred years later oil and gas would provide almost three-quarters of all the energy consumed in the United States.

In his time, Drake was engrossed in a private, speculative business venture that was of little concern to anyone beyond the limited circle of people who were associated with him. Certainly it would never have occurred to him that a century later a discussion of public affairs, such as we are now engaged in, would be provoked by his discovery. The fact is, however, that petroleum has become so vital to human welfare everywhere that its availability is a matter of the deepest concern to people and governments the world over.

Since the beginning of American industrial history there has been an abundance of low-cost energy. The existence within our borders of virtually unlimited reserves of coal was the foundation of assured energy. But it has been the abundance of petroleum and natural gas that has been responsible for the more recent dramatic growth of our standards of living and comfort.

Nothwithstanding the vital importance of energy to the public welfare, it is interesting that there have been relatively few instances where regulations were imposed that did not apply to industry in general. The reason, no doubt, has been the wide availability of these resources. Some regulations have made a great contribution to the abundance and usefulness of energy in our American society. Others, perhaps, have done less so.

This is such a broad and ramified subject, that for the purpose of this discussion I propose to take a few, specific examples of the more important types of regulation to show how far-reaching, in some instances, has been the impact upon energy of public affairs.

Competition

The maintenance of competition through Anti-Trust legislation for example, has been one of the basic and necessary concepts of our American free-enterprise system. Without the slightest doubt, the over-all effect of this Federal regulation has been on the plus side of the ledger. Under the spur of competition the fuel industries, in particular, have become among the most progressive, efficient and competently managed segments of the American economy. They have provided energy at lower relative cost to the consumer, than in any other industrialized country in the world.

State Regulation of Production

A different type of governmental action, and one of the few that has pertained specifically to the energy industry, has been the regulation of crude oil production by some of the petroleum-producing states. This development, dating from the 1920's, has had a vital bearing on the long-term availability of domestic energy resources through the conservation of crude oil reserves.

Before state regulation was instituted, periods of over-production decreased reservoir pressures prematurely, and the ultimate recovery of oil was drastically reduced. Prices often reacted violently to relatively small variations in supply or demand, and a boom-or-bust psychology created waste, inefficiency and financial instability.

Methods used by the State Commissions, especially in Texas, have contributed substantially to the conservation of petroleum resources. They have also brought a larger measure of stability to the industry, efficiency has improved and great technical progress has taken place. There is ample opportunity for still further progress if these incentives can be maintained. Presently known methods of production can only recover about 30% of the original crude oil in place, and reserve figures are predicated on that basis. Even small improvements in producing techniques, therefore, can add substantially to the over-all reserves.

One of the practical effects of state regulation has been to make possible an expansion of production for emergencies of between 2 and 3 million barrels daily. It is improbable that the higher figure could be sustained for any appreciable length of time without affecting the ultimate recovery, and a lower estimate would be more realistic. The Suez emergency indicated, how-

ever, that even an increase of one million barrels daily was not possible to attain in practice, due to a lack of pipeline facilities to market. But, regardless of the reason, if a reserve potential is to be useful, the facilities must exist before the emergency arises, and some form of incentive to the industry would seem justified. In the Suez incident it is doubtful if the shortages in Europe could have been met had it not been for an unanticipated increase of production from South America.

Natural Gas

Another and more recent area where government action has had an impact upon domestic sources of energy, is in the field of natural gas. This is one of the few instances, if not the only one, where the Federal Government is exercising direct regulation of fuel prices at the source of production under peace-time conditions.

The action was not the result of direct legislation, but took place through a chain of legal circumstances, which culminated in the Phillips Decision of the Supreme Court in 1954. Without entering into the legal background of the case, it is sufficient to point out some of the economic consequences to the over-all energy situation.

Until recent years natural gas was essentially a surplus by-product of crude oil production. At the time regulatory action commenced, prices were on the order of 10 cents per MCF or less at the well head. On a BTU basis, this was equivalent to something less than 60 cents per barrel, compared to the average prevailing crude oil price of about $3.00 per barrel. The effect of perpetuating this abnormally low price for gas has stimulated its use at the expense of other fuels—especially oil. If exploration and production of oil and gas are regarded as a joint-cost operation, as they certainly are, then gas is far from carrying its share of the cost at such price levels. The result has been a substantial drop in the incentive to develop new reserves of both gas and oil.

The impact of gas upon the over-all use of petroleum energy is shown by the consumption figures over the last ten years. Expressed on an equivalent fuel basis, from 1948 to 1958 gas (including gas liquids) increased from 2.9 million B/D to 6.2 million B/D or 115%, while domestic crude oil production increased from 5.5 million B/D to 6.7 million B/D or 22%. If these trends of growth continue much longer, gas, which was formerly a by-product, will become the largest domestic source of energy.

The maintenance of an artificially low price for gas also has had a depressing effect on coal which, until recent years, has consistently contributed a third or more of the domestic energy requirements. While extremely large domestic reserves of coal are theoretically available, the practical effect is to cause a premature abandonment of mines and other facilities which, once closed, cannot be economically revived except under conditions of abnormally high prices. The drifting away of skilled work forces into other occupations is equally serious in its long-term aspects.

While the short-term effect of this political action has been to provide energy at lower cost and in greater volume, the depressing effect on production of oil and coal—together with the reduced incentives to locate additional reserves of oil and gas—may well prove to be anything but helpful in maintaining long-term abundance. The free play of economic forces in determining the competitive fuel pattern would eventually dictate the optimum use of natural gas, and would minimize its use in uneconomic ways.

Ownership of Subsoil

One of the fundamental differences that has developed in the growth pattern of energy around the world has involved the ownership of the subsoil rights.

The early development of the coal and petroleum industries in the United States was predicated on the concept that the landowner held title to the underlying minerals. This philosophy has continued, with the result that the application of statutory and legal processes have been applied with reasonable impartiality between the landowner and the producer. Governmental action or politics has not entered into this aspect of the energy picture.

In many foreign countries, however, the state owns the resources *in situ*. It has either produced them as a government enterprise or leased them under some form of contractual agreement. In either event, the production of energy becomes inextricably bound up in the processes of government—and in public affairs.

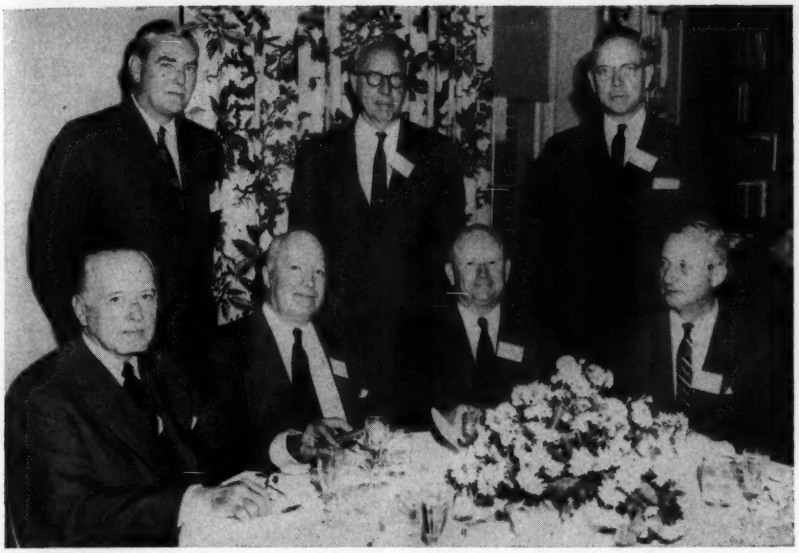
Little need be said here about direct government operation of oil production that has not already been stated elsewhere many times before. It is perhaps pertinent to note, however, that countries which have pursued the philosophy of nationalized operation, excluding the Communist bloc, are estimated to contain less than 2% of the free world's discovered reserves of oil. In each instance the decision to undertake government operation was political rather than economic.

In contrast, the countries where energy resources are owned by the state, but operated under some form of contractual agreement, possess almost 90% of the free world's proven petroleum reserves. The nations in which these major reserves occur, with but few exceptions, are in the so-called less developed category. In most instances their petroleum resources—actual or potential—are overwhelming in size compared to their other economic assets, and their hopes and aspirations for economic and social improvement revolve largely around the expansion of petroleum production.

From a political standpoint there are a number of practical consequences. These governments naturally want the maximum possible revenue, employment and other benefits that it is possible to achieve. It is also a matter of national pride that the income shall be not less than that of any other producing country. In such a setting the appeal of nationalism can cause strong emotional response in public opinion, and under such pressures it is understandable that governments may find difficulty in carrying out their contractual agreements. The chances of friction and misunderstanding—or in some instances even an impasse—are considerable. Organized Communist agitation has often compounded the difficulties.

The cost of energy from foreign sources has tended to rise steadily, not only because of the pressure for larger governmental royalties or taxes, but also due to the higher costs of operation incident to the improvement of their economies. On the average, however, costs are still somewhat below those in the older areas, primarily because of the prolific nature of their oil fields.

The great abundance and wide geographic distribution of petroleum may, to some extent, bring about a more sobering perspective of these governments in international affairs. Within the last three years discoveries have been made in several new areas which give promise of providing very large



AT ENERGY SEMINAR — Petroleum will be a principal source of energy for a long time to come was the consensus among speakers at a day-long symposium on "Energy and Man" held at New York, Nov. 4 under the sponsorship of Columbia University and the American Petroleum Institute. The seminar was part of the 100th anniversary of the petroleum industry. Left to right standing are Herbert Hoover, Jr., former U. S. undersecretary of State; Prof. Edward S. Mason of Harvard University and Robert G. Dunlop, president of Sun Oil Co. Seated are Grayson Kirk, president of Columbia; Frank M. Porter, president of API; Dean Courtney Brown of the Columbia Graduate School of Business, and Allan Nevins, Pulitzer Prize historian. Hoover, Mason, Dunlop and Nevins presented papers at the seminar as did Dr. Edward Teller, noted physicist (not shown).

reserves. Additional countries, where only moderate quantities have been found so far, could conceivably fulfill their own requirements or even develop a surplus for export.

On the whole, the wide geographic distribution of these new reserves should be a helpful factor in peaceful progress. The fact remains, however, there is a vast potential over-supply of petroleum energy available in the world today and, barring some unexpected emergency, will continue to exist for many years to come.

Petroleum Imports

The most recent instance of governmental action affecting the domestic supply of energy has been the Federal limitation of petroleum imports from abroad.

Until ten years ago the United States supplied all of its own petroleum requirements and even had some surplus for export. Beginning about 1947 conditions changed, although the effects were obscured and delayed by a series of events which included the war in Korea, the shut-down of production in Iran, and the closing of the Suez Canal and the Syrian pipelines.

Since 1947 the costs of exploration and production have risen in the United States due to substantial increases in wages and materials. At the same time the discovery rate increased abroad and a large potential volume of low-cost production was developed, substantially in excess of world demand.

The American situation became acute in 1957 when the Suez Canal and the pipelines returned to normal operation. Estimates of imports for the last half of 1957, when added to normal domestic production, were far in excess of domestic demand.

Under the authority of the Trade Agreements Act, a voluntary system of import limitation was adopted by the Federal government in 1957. Subsequently, in the early part of 1959, a mandatory system was placed in effect. It is too early to determine whether the present method of control will prove to be the most desirable one, or if some alternative may be more suitable. The administrative problem is not so much one of determining the total volume of imports as it is the choice of the method in apportioning the imports among individual elements of the industry. Regardless of this difficulty, however, it seems certain that some form of limitation will continue for the foreseeable future.

In setting forth the reasons for import controls in 1957, the President's Cabinet Committee summarized the situation in the following words:

"Unless a reasonable limitation of petroleum imports is brought about, your committee believes that: (1) Oil imports will flow into this country in ever-mounting quantities, entirely disproportionate to the quantities needed to supplement domestic supply. (2) There will be a resultant discouragement of and decrease in, domestic production. (3) There will be a marked decline in domestic exploration and development. (4) In the event of a serious emergency, this Nation will find itself years away from attaining the level of petroleum production necessary to meet our national security needs."

In basing its recommendations on the grounds of national security, of course, the committee was guided by broad considerations of the national interest and safety, and not alone by the more narrow requirements of military logistics.

From a purely military standpoint, a discussion of energy resources often becomes lost in arguments of whether another emergency would become a global, short, and immediately devastating general war; or a situation of more limited and prolonged character. We pray fervently that neither will happen, but it is well to remember that two of the major emergencies that have actually taken place in the last 15 years —Korea and Suez—required rapid and full-scale mobilization of the free-world's energy resources.

In view of the kind of world we are living in, it would seem prudent to be prepared for either alternative, and leave no room for miscalculation by those who might be tempted to indulge in it.

From the broad standpoint of national security, the ultimate success of this or any other method of limiting petroleum imports lies in the results to be achieved. It will require some years before a judgment can be reached because of the appreciable time lag between initial exploration and the final availability of proven resources. In addition, there are other economic crosscurrents, such as the natural gas situation, that preclude arriving at an immediate conclusion.

There seems to be general agreement, however, that adequate prospects for new fields are still available, and that given reasonable incentives to find them, ample domestic reserves can be maintained for the foreseeable future. The necessity of continuing governmental policies that provide such

incentives is of the utmost importance.

Over a period of almost two centuries in our national existence, one of our strongest assets in working toward peaceful and constructive solutions to many of the world's problems, is that we have been independent in one of our most vital resources—energy.

It is my strong conviction that it is of paramount importance to the security of our nation that we should maintain this FREEDOM in the future.

Columbia University Oil Symposium Discusses "Energy & Man"

Five outstanding speakers discussed "Energy and Man" in a symposium commemorating the 100th anniversary of the founding of the oil industry. Some 300 leaders of business, government, publishing and education, attended.

The meeting at Columbia University in New York City was held November 4 and was sponsored by Columbia's Graduate School of Business and the American Petroleum Institute.

Kinzie Miller, president and editor of the California Oil World, was among those who attended.

The speakers included, beside Herbert Hoover, Jr., Dr. Edward Teller, a noted physicist; Allan Nevins, Pulitzer Prize winning historian; Professor Edward S. Mason of Harvard University and Robert G. Dunlop, president of Sun Oil Co.

Dr. Edward Teller predicted that airplanes and other moving vehicles would use conventional fuels for power for years and "maybe for centuries" to come.

The noted physicist urged concentration on nuclear reactors as a source for stationary power rather than for machines that move.

Other speakers took a similar view that petroleum and other conventional fuels would be major sources of power for years to come.

Teller said that "within the present century there need not be a shortage of any fuel." But he predicted that nuclear energy would be used for stationary power and he said that more heat could be gotten out of a ton of granite than out of a ton of coal if a way could be found to extract the uranium.

"Then you will be literally able to burn rocks and the energy problem will be solved" he said.

Teller made a strong plea for experimental peaceful nuclear explosions. Discounting the danger of fallout, he said nuclear blasts could be used to dig harbors, to produce "mined" heat and to separate oil from shale.

"All these dreams will come true if we are permitted to experiment with nuclear explosions," Teller said.

Dunlop said the petroleum industry, by constantly reducing costs, "has taken much of the shock out of gasoline taxes so far as the motorist is concerned." But he added that no one could say how long the industry could continue to do this.

"When the tax on an essential commodity reaches the point that it virtually equals the manufacturer's price, as gasoline taxes do today, one may wonder whether the government purse is being fattened at the expense of long-range public interest," Dunlop said.

Mason maintained that the free world would draw less than 10 per cent of total energy requirements from nuclear sources by 1980.

"This means that during the next two decades, so far as commercial sources are concerned, we shall continue to be dependent on hydro-power, coal, gas and, primarily oil," Mason said.

Nevins, calling for emphasis on so-called "pure" research, said the Atlantic Community cannot succeed unless it expands its scientific base in systematic fashion.

It would be well, he said, to found at least a few universities which would draw their faculties and students broadly from the entire Atlantic community.

"The energy represented by coal seams and oil pools is limited," Nevins said. "But as the quest of pure science is endless, so the results it may bring, the vistas it may open, are infinite."

Public Must Understand What Stimulates Industrial Growth

The United States can win the contest with the Russians "only if there is public understanding of what stimulates industrial genius and technological growth," Lammot du Pont Copeland, a vice president, director, and member of the Executive Committee of the Du Pont Company, said on Nov. 5. He addressed the dinner meeting of the 12th national conference of the Public Relations Society of America.

The Soviet challenge of industrial and business competition "is actually a political challenge," which "will be waged with industrial genius and technology as the principal weapons," Copeland declared. "We can win it only if there is public understanding of what stimulates industrial genius and technological growth."

He emphasized, "It is not the future of business alone that is riding on the outcome of the conflicts of opinion that now rage. It is the American economic system . . . the future of our concept of a republic as the best form of government for a people . . . Default at home from our principles may not be as destructive as another world war, but it will be just as effective in ending our way of life."

"Business must plead no special interest. It must seek no special advantage. It should, however, carry no special burden. It should receive no special penalties.

"The danger is that some among us will put artificial restraints on the economic system that can choke off progress . . . And in the international struggle the United States cannot wage either an economic or a military contest with the Soviet Union if it has one arm tied behind its back."

"There are three large areas in which the idea barrier presents us today with formidable obstacles," Copeland said. "Each of them, in my opinion, is a lingering emotional remnant of bygone days, long since eliminated as a valid doctrine, yet remembered sufficiently to cause confusion.

"The three danger areas are these: The first is the tendency to burden our economy with enfeebling restraints, either from government in the form of controls or from labor in the form of practices which hinder the productive process. The second is the imposition of legislative enactments which will inevitably reduce the incentive to investment and to personal achievement. The third is the misunderstanding over the role of the corporation and of the technological development as an instrument of accomplishment."

He noted, as example, that "the behavior of some labor groups in the domestic area presupposes that the limits to employment are absolute, that the job eliminated today by some new development is beyond replacement."

He said, however, that "in a dynamic economy, job assignments change continually and that for every buggy maker eliminated, 10 were added to automobile assembly lines."

Encouraged to Learn the Joy of Discovery

To a youngster, the whole world—from sea to stratosphere—is his to explore. From his searching . . . studying . . . questioning, he occasionally grasps the meaning of what he sees. It is then—when he uncovers for himself a bit of the wonders of nature and science—that he experiences the joy that comes with discovery.

Today, educators in schools and universities believe, as we do, that it is important to encourage young people to pursue their interest in science. General Petroleum, in line with this belief, provides for school-age youngsters the film "In the Beginning," a geologic history of the earth . . . helps with the teenagers' Science Fairs and donates a total of 13 undergraduate and graduate scholarships in the fields of petroleum engineering, geology and geophysics.

These are just some of the many efforts that General Petroleum is making to benefit our younger citizens, and in the process help them to learn that the joy of discovery need not be restricted to childhood alone.

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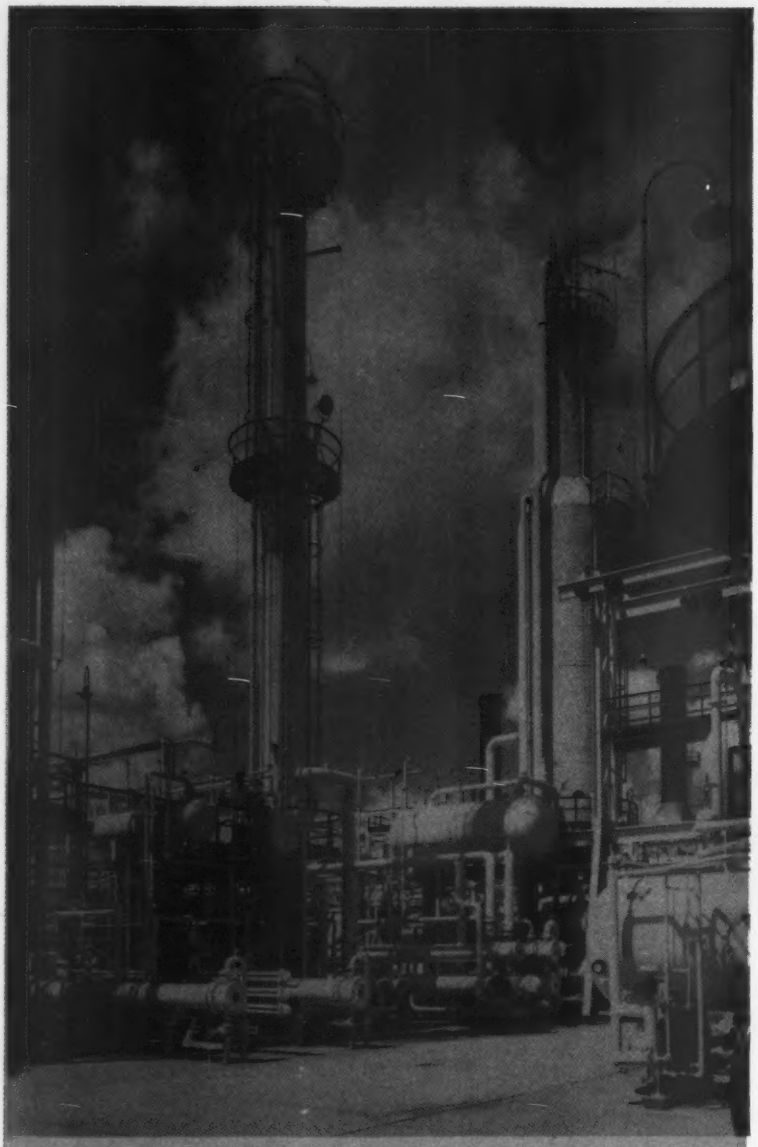

(Above) This view of Platformer LPG recovery section shows deethanizer (left) and depropanizer tower (center). Third tower (right) is Unifining Unit's stripper column.

New Platforming® unit boosts production of high-octane gasoline nearly 200%

DX Sunray upgrades product quality, boosts motor fuel production capacity, with five new UOP process units

by Harry A. Brown
Vice President of Manufacturing
DX Sunray Oil Company,
Tulsa, Oklahoma

In little more than three years after becoming the refining and marketing subsidiary of Sunray Mid-Continent Oil Co., DX Sunray Oil Co. launched a major modernization program.

Harry A. Brown

In early 1959 we placed on stream at our West Tulsa refinery a 20,000 BPSD Unifining* unit, a 12,000 BPSD Platforming unit, a 2,400 BPSD Isomerization Unit and a 2,500 BPSD HF Alkylation unit. At about the same time we added at our Duncan, Oklahoma, refinery a 6,000 BPSD Unifining* unit to an existing layout which already included a 6,000 BPSD Platforming® unit, a 22,000 BPSD Fluid Catalytic Cracking unit, a 3,500 BPSD HF Alkylation unit and a 750 BPSD Catalytic Condensation unit. Installed at a cost of $12 million, and designed and engineered by Universal Oil Products Company, our new units are the most modern available and were installed to carry out our avowed objective of marketing high-quality products.

Triples high-octane output

The four UOP units provide more high-octane gasoline than the Tulsa refinery previously manufactured. The new Platformer almost triples the output of high octane gasoline there, and addition of the new HF Alkylation unit more than doubles DX Sunray's potential for producing 105-octane gasoline.

*Trademark

Being charged to the new Unifining unit is a blend of straight-run and coker naphthas for preparation as feed stock to two Platformers. These include a 7,500 BPSD reforming unit that was converted to UOP Platforming in June of 1956 and the new 12,000 BPSD unit completed this year. At relatively low cost, Unifining desulfurizes and purifies the Platforming feed stock and transforms olefins into paraffins. Combined operation with Platforming provides a most economical source for the hydrogen required in Unifining.

LPG unit recovers butane, propane

At the new Platforming unit, the Unifined, depentanized C_6-plus naphtha, or feed stock, is heated and contacted with a specially prepared platinum-containing catalyst under operating conditions to produce a C_5-plus gasoline with a leaded octane number as high as 99, if required. A rerun tower is provided for preparation of selected blending stocks. In conjunction with the Platformer there is an LPG unit designed to recover 92% butane and 60% propane.

In conjunction with the decision to modernize the Tulsa refinery, we gave careful consideration to future demands for higher-octane gasoline. Expanded facilities for alkylation, to produce motor alkylate as a blending component, were chosen since sufficient quantities of butane available in our refinery streams could be isomerized and, as isobutane, utilized as one of the feed stocks for HF Alkylation. Universal engineers, therefore, designed a 2,400 BPSD Butane Isomerization unit to service the HF Alkylation facility. The two processes are controlled and operated as a single unit.

Could produce 105-plus leaded octane

The HF Alkylation unit product is 2,500 BPSD of 105-octane gasoline blending stock. Actually, the unit would permit the Tulsa plant to turn out gasoline exceeding the 105 octane number (leaded) if market conditions should so dictate. However, DX Sunray has no immediate plans for producing motor fuels in such super ranges. If and when the need for higher-octane gasoline arises, we're ready for several years to come. Meanwhile, much of this high-octane alkylate is used to manufacture aviation gasoline. The remainder is blended with other refinery stock to produce a premium gasoline which is equal or superior in quality to any in the DX marketing area.

Combination HF Alkylation— Butane Isomerization unit assures potential production of super-octane gasoline

View of DX Sunray's Isomerization unit showing three reactors at left. Second tallest tower (center) is the debutanizer column. Deisobutanizer (right) is the highest refinery tower in Oklahoma.

UOP® UNIVERSAL OIL PRODUCTS COMPANY
30 Algonquin Road, Des Plaines, Illinois, U.S.A.
More Than Forty Years Of Leadership In Petroleum Refining Technology

Petroleum LORE and LINGO

By RICHARD SNEDDON

The Bricked-in Boiler

The first refinery of which we have any record was a bricked-up boiler with a fireplace underneath. Leading off from somewhere near the top of the boiler was a pipe that coiled its way through a cold water tank. This was the condenser and at the far end of the condenser was a barrel or other receiver in which the distillate was collected. At the bottom of the boiler or "shell," as it was known, was another pipe with a valve in it that could be opened to bleed off the heavy residual oil after the distillation had been completed. That is to say, if the heavy residual oil was fluid enough to run through a pipe . . . Otherwise it simply had to be chiselled or scraped out.

The device was older than Mathusalah! Brewers and vinters had used it for hundreds of years and long before the manufacture of the giggling waters had been initiated, alchemists and chemists had employed it on a smaller scale in their laboratories while they searched for the Philosopher's Stone that was to transmute all metals into gold, and the elixir that was to keep the human race eternally young and beautiful. If you think we are having a population problem now, imagine what would be happening if the elixir had been found!

It probably wasn't long until the first oil refiner began to notice that the water in the "condenser box," which is what they called the tank with the coils in it, was heating up and some of the distillate was escaping as gas into the air. To mend this situation, he equipped the condenser box with an inlet, an outlet and the necessary pump and piping to keep a continuous stream of cold water running through it.

The Batch System

In the first efforts at oil refining there was no break in the distillation process. It was started by building a fire in the firebox and it was continued until nothing more would come over into the receiver. This was known as a batch still as distinguished from the pipe stills now used. "Batch" is from the Anglo-Saxon word bacan, "to bake." It really means "the amount of bread that can be baked at one time" but in this instance, of course, means "the quantity of oil that can be distilled at one time."

Chemists knew as has already been intimated that petroleum was made up of several series of hydrocarbons, the members of each series increasing in molecular weight and boiling point as they progressed from the lightest to the heaviest component. The first four are gases at atmospheric temperature and pressure and the rest graduate from extremely light liquids to solids. The next step in refining was to separate these into fractions. The simplest way to do this was to change the receiver at intervals as the still temperature rose or as the character of distillate showed some difference in appearance. It could also be done, however, by just leaving the receiver where it was and switching the stream by means of a valve to another condenser and receiver.

Growing Pains

When the operation became big enough, tanks were substituted for barrels. Then tube stills came into being. In these the oil flowed continuously through a maze of small pipes which were heated by gas or oil burners. These were more effective because of the greater surface that was exposed to direct heat. Of course, the tubes eventually carboned up and the operation had to be shut down while they were cleaned. This, however, was still vastly better than shutting down after every batch in the old shell still.

To avoid further unnecessary repetition and to make the separation of the various fractions at once more automatic and more complete, the old crude distillate box-type condenser was tossed out in favor of a tall "bubble" tower with many trays or perforated plates between the bottom and the top. The hot vapors from the crude stills ascend this column, bubbling through the condensate that has formed in the upper reaches and is now dribbling downwards.

Continuous Fractionation

The heaviest fraction comes off through an outlet at the bottom, the light gases go over the top, and in graduating stages other fractions are piped off according to their boiling points, the separation being aided by pressures or lack of pressures within the unit. Thus are segregated gas, light gasoline, kerosene, diesel, lubricating oil, gas oil, fuel oil, and asphalt fractions, all of which are subsequently treated to produce literally thousands of useful products. The flow from the various parts of the condenser gravitates or is pumped to tanks for temporary storage, or may go direct to the unit that is next in its processing sequence.

The kerosene lamp had created an unprecedented demand for illuminants and the inevitable setting up of specifications. The illuminant had to be free from unsaturates, gums, resins, and other components that might cause smoking or wick encrustment. Hence the development of treatment with sulphuric acid to remove these undesirables and hence also, since sulphuric acid is itself a dangerous commodity in many ways, the need for an additional treatment with caustic soda to neutralize the sulphuric acid. Actually caustic soda is not the best thing for the human epidermis either, and, for other reasons, is not good in kerosene, so a water wash or two

in an agitator was required to get rid of the last trace of the neutralizer.

The Sludge Pond

So, slowly the refinery was losing its original simplicity. When oils containing unsaturates are treated with sulphuric acid, a black unappetizing sludge is formed for which in the beginning no use could be found, so a sludge pond had to be added to the general layout. "Sludge" is another of these echoic words that attempts to mimic a sound, in this case the sound of splashing mud. It is akin to "slush," "slosh," "slurp," and other comic book vocables that in the main are very expressive but by no means delicate.

The sludge that is formed in oil as described is evidence of the formation of new compounds, very complex ones, through the union of what chemists call the sulphonic radical with the unsaturates in the hydrocarbon mixture. (The sulphonic grouping is sulphuric acid (H_2SO_4) minus a hydroxyl (OH) radical, which is HSO_3 as you can check for yourself by subtracting the OH.

For the moment, however, we are more interested in the mechanics than the chemistry of refining. How it grew rather haphazardly, like the home of a family that continues to have children through the years and adds a room here and there and a new gadget to take care of the growing need.

After the kerosene rule came the automobile age with an insistent demand not only for more gasoline but for better gasoline. Thus came into being giant cracking plants, polymerization units and all their auxiliary kith and kin. The refineries grew higher, more spacious and more involved with every new development. So greatly was progress accelerated by successive wars, that they were never for long allowed to retain any particular form or shape.

The Octane Contest

The octane race initiated the need for stocks rich in aromatics, olefins, iso-paraffins and other anti-knock components. So, the refiners revamped existing facilities and added alkylation units, platformers, and other molecule refashioning apparatuses and devices.

Meantime, the discovery of tetraethyl lead turned the minds of researchers to additives for an infinite variety of purposes. The airplane was perfected and became the power-balance factor in the Second World War. More speed, more maneuverability, and more range in the air, were imperatives of success in the battle for the skies. And this was a conflict that threatened the very existence of freedom.

When the octane development started almost 40 years ago, automobile compression ratios were about 4 to 1, and the octane number of the average straight-run gasoline was approximately 60. Today we have engines with compressions ratios of 12 to 1, and service stations regularly handle gasolines with octane numbers in excess of 100.

At the present time compression ratios are still rising at the rate of half a point a year and the cost of adjustment to this is terrific. Half a point rise in compression ratio requires a corresponding rise of 1½ octane numbers in the fuel. A change like that can cost refiners anything from ten to twenty million dollars. And don't forget that they still have to furnish the appropriate octane number gasoline for all the other cars on the highway, from comparatively recent models to jalopies that are 20 years old. In this regard it is interesting that some companies are now blending a high anti-knock stock with regular gasoline right at the service station to suit a wide range of compression ratios.

Aviation Becomes Involved

What happened in the automotive industry happened also in the aviation industry, only faster. During the Second World War, it became evident that high octane aviation fuel actually spelled the difference between victory and defeat. The business of building a modern war machine and at the same time helping our allies to keep the madmen at bay until we had their straight jackets ready was no minor task.

The love of peace is strong in the American heart and there was a bloc of public opinion to be overcome before an all out effort could be made. The sneak attack on Pearl Harbor did the trick. It unified the people of the United States as all the political pressure and talk in the world never could have done.

Hitler had taken 20 years to build

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his prodigious war machine which was a pretty sizable start to overcome. In an incredibly short time we converted to a war economy and in a short time more while our allies held the enemy off, we not only caught up with him—we forged out into the lead. We built planes at the rate of 100,000 a year and special fuels on which to fly them. Both became obsolete almost before they came out of the factories and refineries.

We designed new planes and new fuels faster than the world thought possible. In two years we were out producing Krupp, Fiat and Skoda and had taken over the initiative in the most violent and altogether fantastic war in history.

In the zenith of his cockiness, Hitler called the British "military idiots" and Americans, "decadent, pleasure loving people." But when it came to the showdown, it was an army of military idiots that chased Rommel all the way across Egypt and Libya and in the clean-up proceedings at Tunisia, tanks, planes and guns, made and operated by decadent, pleasure loving Americans forced 250,000 of these so-called "crack troops" to give themselves up in ignominious surrender.

Need Grows for Higher Octane

All of this had a terrific impact on the petroleum refineries. It created an urgent demand for ultra-modern fuels and lubricants for new type land, air, and water vehicles. It tremendously increased the need for research chemists, physicist, engineers and economists to look beyond immediate need, sense changing trends and attitudes and convert each new discovery into a usable process or practical application, without delay.

It was during this same hectic period that we launched, with wide open throttle, into the problems and potential of atomic energy. And, it is the continuation of this same program that brings us now helter skelter into the era of inter-continental guided missiles and space flight.

What this means to the future of refining is impossible to conceive. At the beginning of the war, the government financed and had constructed across the country, a group of refineries, designed especially for the manufacture of high octane aviation gasoline. They were equipped with catalytic crackers and everything that was then available to yield the best possible fuels.

Now we are out beyond the cat cracker to new species of catalytic reformers in which straight run gasoline is changed to high octane stock. The parallel trend of high compression and high octane gasoline is still upwards. There seems to be no end to this race.

Some conception of the growing need may be gathered from the fact that a turbo-jet plane eats up kerosene at the rate of 700 gallons an hour while it is idling on the ground. In flight it consumes 2400 gallons an hour. This is five times the consumption of comparable piston-engined ships, such as the Super-Constellation.

Other Commodities

So far we have largely been discussing gasoline and the effect on the changing form of the refinery, but there are many other products that have had their respective effects. Lubricating oils, usually derived from special types of crude were once pretty generally obtained by steam distillation. In this type of separation, steam from a boiler was bubbled through hot crude in a retort. It picked up and carried along lubricating oil fractions, light first—heavy last, as it made its way through condenser to receiver. The subsequent separation of oil and water was a simple matter.

Today lubricating oils are separated more effectively by special solvents. When a paraffinic crude, for example, is agitated with propane under pressure it settles in two distinct layers, one containing all the asphaltic material and the other clear and amber colored, containing the paraffins.

The black layer of asphaltenes which collects at the bottom can be drawn off, leaving only the solution of paraffins in propane — still, remember, under pressure. If there are any waxy paraffins in our stock it is merely necessary to release the pressure inside the container. This causes the liquid propane to change to gas and in doing so it chills the paraffins. At low temperature the waxes are solid so they precipitate out of solution and can be separated by filtration or by pressing the flakes together and lifting them out.

This process demands a new lot of agitators, filter presses, treating vessels, pressurized containers and other equipment that adds still more to the Rube Goldbergian appearance of the refinery.

Other heavy oils may be simply "topped," that is, distilled to remove the small percentage of light fractions they may contain; and the remainder then is fuel oil or asphalt depending on the nature of the crude and the subsequent treatment of the residual fraction.

Variety Adds Spice

The modern refinery features many kinds of distillation and treatment. Of the former there are three commonly used types—atmospheric vacuum and steam distillation. Excepting for the vacuum species these have already been described. Everyone knows, however, that the higher the elevation at which water is boiled, the lower the temperature, until if it is taken high enough it will boil like the dickens although it is scarcely warm. This is because of the lesser air pressure in the higher reaches and it explains the principle of vacuum distillation.

At sea level, on every square inch of water surface, there is bearing down a column of air weighing 14.7 lbs. It thus takes more heat to drive off the water moleclues in the form of steam on ground level than it does at the top of the mountain where the air column is shorter by the height of the mountain. By putting water in a partly evacuated and closed vessel, the boiling point is similarly depressed because of the lack of air pressure.

So also are the boiling points of a series of components such as are found in crude oil or any sizable fraction thereof. Vacuum fractionation can, thus, do two things so far as the refiner is concerned, it can enable him to vaporize liquids at temperatures below their normal boiling points and since heat is expensive it enables him to lower distillation costs.

The Basic Stocks

Going back to the crude distillation unit, it should be noted that there the raw materials are merely divided into fractions, which remain as they were originally. No change has been contrived in their basic character or molecular structure. They do, however, constitute the stocks that are really reshaped by the wizardry of the cat cracker,

thermal cracker, alkylation plant, catalytic reformer, paraxylene plant, phthalic anhydride plant, polymer plant, and a dozen and one equally strange looking creations of which we shall learn more anon.

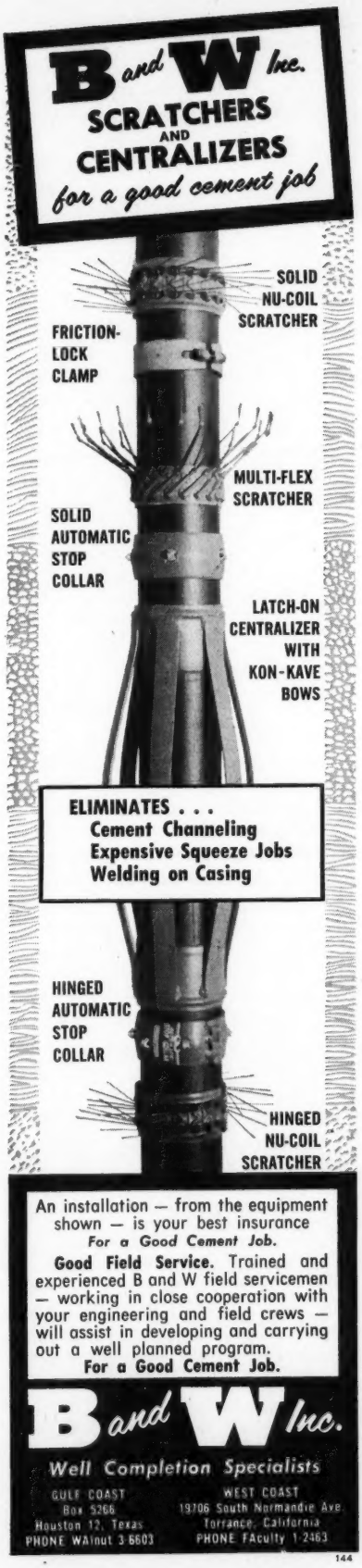
Out of them come gaseous fuels for industrial use; liquid petroleum gases (propane and butane) for the kitchen stoves of people who have used wood and coal all their lives; aviation and motor gasolines, synthetic fibers; paints and plastics; solvents of great variety; kerosene for stoves, lamps and jet planes; diesel and furnace oil for railway trains and for home heating; detergents; fuel oil for steamships; paraffin wax for candles and wrapping papers; lubricating oils and greases; and asphalts and greases. In the petrochemical field there are hundreds of commodities now produced from petroleum that were formerly produced from coal tar, each requiring some modification of equipment or process.

Now Look At It

The result is that the little bricked in boiler with its simple condenser and receiver has blossomed into a sort of geometric nightmare, featuring sky-scraping structures with spiral reaches of ladders and stairways peeping furtively from within. A rash of variegated projections and protuberances break up the external view. Indiscriminate groupings of towers and cylinders, tall and short, fat and lean, rise irregularly from the ground. Glistening spheroids hurl the sun's rays out into space. And an endless vista of oblongs, squares, and circles give the layout a sort of modernistic city appearance that is hard to describe. All its multitudinous parts are tied together by miles and miles of pipe, some as big in diameter as a railway tunnel and some no larger than a stick of spaghetti. The entire affair looks as if it might have been conceived in the mind of a crazed fiction writer, and erected, without plans, by a movie-set builder with a touch of insanity.

Spud in Second Gas Exploratory Well

State Exploration Co., Los Angeles, reports it has spudded in its second gas exploratory well in Beaver County, Oklahoma, within ten days.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25 Years of Wax Refining By Bareco of Petrolite

R. F. Scivally, vice president and general manager of Bareco Wax Company division of Petrolite Corporation, has announced that 1960 will mark 25 years of wax refining by Bareco. 1960 will also mark the first five years of Bareco Wax Company as a division of Petrolite Corporation.

Bareco microcrystalline waxes are used in many products in the U. S. and are exported to virtually every country in the free world, even to South America, the main source of carnauba.

Since 1955, the Bareco refinery at Barnsdall, Oklahoma has carried on a thorough and complete modernization program. The distillation equipment has been modernized, and new moulding and handling facilities have been added. In 1956 the Kilgore, Texas refinery installed additional refinery equipment to increase operating efficiency and economy. A current expansion program will enable this refinery to increase its de-oiling capacity.

This expansion program, necessitated by the increasing demand for the numerous grades of microcrystalline waxes, has been stimulated by the many quality improvements in microcrystalline waxes. Many of these have resulted from the Petrolite Corporation's continuing wax research program.

Buttes Completes Purchase Of Sutter City Lease

Buttes Gas and Oil Company has announced its complete ownership of the Sutter City Community lease (Sutter County, California) and all future revenues with the liquidation of its purchase obligations to the Richfield Oil Corp.

Buttes entered into an agreement September 30, 1956 to purchase Richfield's half interest in the Sutter City Community lease for the price of 1,800,000 MCF of gas, equivalent to $465,065.73.

In announcing that payment in full has been made to Richfield, Buttes President, O. G. Green, said that in less than three years $465,000 has been paid out of income and that now all future income from the Sutter City field will be owned entirely by Buttes.

Buttes currently has four commercial gas wells located on the lease area, which covers approximately 3600 acres.

Independent Oil Producers Form Committee to Correct Excessive Imports Into Calif.

Formation of a committee of independent oil producers to correct excessive foreign oil imports into California and other Western states, was announced in Los Angeles.

The action marked the first time that associations representing several hundred independent operators have formed a common front to obtain relief from conditions which they described in a joint statement as damaging "to the national security, the welfare of the State of California, and the economy of the California oil industry."

The independents also launched an industry-wide survey to obtain up-to-the-minute statistical data from all producers in justification of their contention that the Federal Government must act at once to curb economy-wrecking foreign oil imports.

Four associations are acting in concert in the new move to stem the flow of foreign oil into District V, which comprises, California, Oregon, Washington, Nevada, Arizona, Alaska and Hawaii.

They are the California Stripper Well Association, Los Angeles, V. R. G. Wilbur, president; the Independent Oil Producers Agency, San Francisco, A. Duane Bush, president; Oil Producers Agency of California, Los Angeles, Richard R. Von Hagen, president, and San Joaquin Valley Oil Producers Association, Bakersfield, Glenn C. Ferguson, president.

Additionally, a state-wide committee of independent oil producers is being formed to map a detailed plan of action including direct representations to Washington to obtain immediate relief. Members of the committee will be announced in a few days.

The four associations, by means of a questionnaire, seek factual data for 1958-59 on crude production, prices, contracts and related economic information.

The Federal Government's oil import program was instituted for District V in January, 1958, as a voluntary plan, which proved to be ineffective not only here, but nation-wide. As a result, President Eisenhower ordered mandatory controls last March.

The independents contend that the mandatory controls have failed to remedy the situation in District V, because they still permit excessive foreign oil to pour into the west in destructive competition with domestic supplies.

"The import program was designed to maintain a healthy and vigorous domestic oil producing industry in the interests of national security, but it has completely failed to achieve those purposes," the Associations declare.

"On the contrary, all phases of development of the independent oil industry have deteriorated during the entire time that the Federal Government's import controls have been in effect," they say.

Production Increase With Bottom Hole Heater Program

Tidewater Oil Company's bottom hole heater program continues to play an important role in increasing production of Flying A wells in the San Joaquin Valley producing heavy crude oil.

In the 12 months since October, 1958, Tidewater installed 162 bottom hole heaters on producing wells in the Kern River, Midway and McKittrick fields. These wells have had a 95 per cent gain in production during the year's time.

Before the installations, the 162 wells pumped 1,945 barrels a day net and 3,362 barrels a day gross. After the heaters were placed in operation, the wells pumped 3,788 barrels a day net and 6,185 barrels a day gross. Average increase per well was about 14 barrels a day.

The heaters are also credited with increasing gas production of the 162 wells in sufficient quantity to meet the fuel needs of the installations.

Prior to October, 1958, 68 wells had been equipped with bottom hole heaters. These wells had an average increase per well of about 20 barrels of oil a day.

By the end of 1959, the total 230 old producing wells with heater installations are expected to add about 3,000 barrels a day to Tidewater's heavy oil production.

Bottom hole heaters have also been installed on 107 new wells drilled and completed during 1959.

In making permanent installations after testing, Tidewater production department employees have favored a 4-well installation including one 1,200,000 BTU/hr. heater, a header system, and two ¾" lines to carry hot water to and from the heat exchanger in each well.

The bottom hole heaters increase pump efficiency and clean tar and gunk out of the liner.

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Petroleum Equipment Suppliers Announce Annual District Membership Meetings in 1960

The Petroleum Equipment Suppliers Association has announced dates for its annual district membership meetings in the spring of 1960.

The Gulf Coast District meeting date has been rescheduled for March 22 at the Shamrock Hilton Hotel in Houston. District Chairman Elliott A. Johnson, Schlumberger Well Surveying Corporation, and his committees will make meeting arrangements.

Pacific District Chairman H. H. Peters, Technical Oil Tool Corporation, Los Angeles, has set April 26 as the date of the meeting for association members in this area. The Ambassador Hotel in Los Angeles will be headquarters for the meeting.

The Northern Mid-Continent District and Eastern District have both chosen early March meeting dates. March 10 has been tentatively scheduled by Northern Mid-Continent District Chairman K. W. Lineberry, Black, Sivalls & Bryson, for the regional meeting in Tulsa at the Mayo Hotel. The Eastern group will meet March 16 at the Duquesne Club in Pittsburgh, Pa. Chairman is Donald W. Mackie, Jr., Bradford Supply Company.

On April 5 association members of the Southern Mid-Continent District will convene at the Statler-Hilton Hotel in Dallas.

Billings, Montana, Geologists To Host Annual Convention

Over 1000 geologists from throughout the Rocky Mountain Empire will convene in Billings, Montana February 7-10, 1960 for the annual Rocky Mountain Section meeting of the American Association of Petroleum Geologists.

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INTERNATIONAL guests and speaker at the November 4, 1959 meeting of the Los Angeles Chapter of Nomads. Left to right (standing) Eberhard Witte of Fagro GMBH from Germany; C. L. Buckingham of Camdrill from Algeria; Patrick L. Dobey of Mobil Oil from Libya; C. M. Williams of L.T.S. from Algeria; Amir H. Amiri of N.I.O.C. from Iran; John Donovan of I.P.C. from Iraq; Ray P. Sprague of Drilexco from Libya; Voyd H. Clark of Aramco from Saudi Arabia; (seated) Wm. H. Anderson of Petrobras from Brazil; Jack Wilkinson of I.P.C. from Iraq; Dick Daugherty, ex-Rams football player, speaker; Don Cox of I.P.C. from Iraq; Roy E. McNeil of Drilling Exploration from Nigeria.

Announces New Officers For Forthcoming Year

John T. (Jack) Isberg, president of the Pacific Section, American Association of Petroleum Geologists, announced the following new officers are at the helm of the local section of the American Association of Petroleum Geologists:

President: Thomas A. Baldwin, Monterey Oil Company. Vice President: Orville L. Bandy, University of Southern California. Secretary: Gordon R. Bell, Western Gulf Oil Company. Treasurer: Richard B. Haines, Continental Oil Company.

Robert B. Moran, Jr., retiring president of the Society of Exploration Geophysicists, announced simultaneously the following new slate of officers:

President: Forrest F. Lambrecht, Texaco, Inc., Vice President, Southern District: Nolen A. Webb, Richfield Oil Corporation. Vice President, Northern District: M. C. MacMurrough, Standard Oil Company. Secretary-Treasurer: T. L. Slaven, Western Geophysical Company. Editor: W. L. Basham, Standard Oil Company.

Petroleum Sessions Set for A.I.Ch.E. San Francisco Meeting

Several sessions in the 52nd Annual Meeting of the American Institute of Chemical Engineers which will be held in San Francisco in the Sheraton Paradise Dec. 6-9 are of particular interest to the petroleum industry. The sessions are part of an outstanding technical program of 22 sessions, at which more than 100 papers will be delivered. The petroleum sessions are co-sponsored by the Society of Petroleum Engineers.

A Monday, Dec. 7, Session is scheduled on the fundamental concepts of thermal methods of recovery of petroleum—in situ combustion, with F. H. Poettmann, supervisor, engineering research, Ohio Oil Company, as chairman.

Two sessions are scheduled on catalytic cracking stocks on Wednesday, Dec. 9. The sessions have been arranged by Wheaton W. Kraft, Lummus Company.

Poettmann also is chairman of two Tuesday, Dec. 8, sessions on fundamental concepts of miscible fluid displacement.

After 5,000 years of mud... superhighways of petroleum

▲ **YESTERDAY.** Muddy roads clutched at the world's wheels, slowing transportation to a worm's pace. Then at last, man found he could make smooth, hard-surfaced roads from asphalt — a non-volatile form of petroleum. In the early promotion of asphalt road-building, Texaco took a prominent part.

◀ **TODAY.** Texaco is one of the world's largest manufacturers of asphalt products. These products make possible great ribbons of smooth superhighways, as well as airport landing strips. They are used for roofing, battery boxes and many other useful items. Texaco's leadership and growth in this field result from its policy of constantly planning for the future.

TEXACO

... CONSTANT PROGRESS IN OIL'S FIRST CENTURY

Lane-Wells' New Approach To Directional Perforating

An entirely new approach to directional perforating for multiple string, tubingless completions was demonstrated recently by Lane-Wells Company, a division of Dresser Industries,

Demonstrate new approach to directional perforating

Inc. The service utilizes a new combination tool to locate collars, position the perforator in the zone of interest, orient the gun away from the other strings of casing, and perforate the desired zone all on one run in one string of casing.

Run by a standard Lane-Wells perforating-logging unit on a standard conductor line, the Directional Perforator consists of a collar locator, a nuclear orientor, a rotator, and a perforator. A surface recorder records the location of collars and the location of other casing strings.

Lane-Wells entire operation is conducted only in the casing to be perforated. The other strings are not disturbed in any way and can be kept on production, if desired, during the entire operation.

The collar locator picks collars on the trip into the well. When the zone of interest is reached, the nuclear orientor scans the zone to locate the position of the other casing strings. This scanning is carried out in stages during which the orientor indicates the presence or absence of casing in a narrow zone immediately in front of the gun. These indications are recorded visually at the surface.

At the completion of the scanning of a stage, the orientor and perforator are rotated to the next stage. This is done by raising or lowering the tool. Only three inches of travel up or down the hole is required for the rotator to move the orientor to the next scanning stage.

The scanning by stages operation is continued around the pipe for at least two complete revolutions. This insures a double check of the location of the other casing strings in relation to the string to be perforated. The perforator is then positioned positively by the same rotator to shoot only in the safe zone away from the other strings. This positioning is double checked with the nuclear orientor before firing.

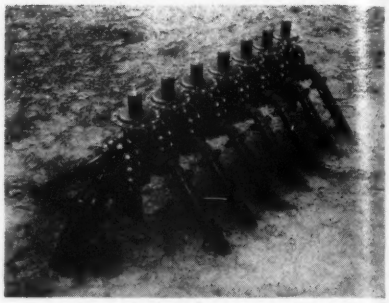
Lane-Wells Company, originators of gun perforating, offers a complete line of technical services for the petroleum industry including all types of perforating, logging and bridging plugs.

National Offers New Valve

A new three-way valve is available from National Sales Company in California. The Mani-Flo Valve was designed primarily for use on lease well production manifolds to eliminate the problems and expenses of conventional valve arrangements of piping, valves and fittings.

The valve may also be used for mixing two different liquids or gases or as a switching valve to divert flow to different tanks or lines.

In any application, the valves may be hydraulically, electrically or diaphragm controlled and sensed by liquid levels, pressures, temperatures, times or differentials of these. They may be installed in a horizontal line with diaphragms and/or handwheels either vertically or horizontally or valves may



Mani-Flo Valve

be stacked vertically with controls pointing in any direction.

With a working pressure of 600 psi, Mani-Flo Valves are available in six basic models.

New Baker Tool Cuts Drill-Out Time Up To 75%

Eight to sixteen hours used to be required to drill out a Retainer Production Packer; the new Baker Packer Milling Tool can cut this time to 2 to 4 hours, with the added bonus of retrieving the packer body so that no debris is left in the hole. You can even safely remove an upper packer of a multiple completion without fear of damaging or affecting the performance of lower packers.

This milling tool was specially designed for use with Baker packers, but its rugged construction, plus the very effective cutting quality of the Baker Milling Carbide Compound used on its milling surfaces, makes it possible to use it to remove other drillable packers of similar design. The Baker Packer Milling Tool, which mills over the packer and retrieves it in one round trip, adds a new dimension to drillability.

The enclosed folder gives the basic facts about the construction and use of this milling tool. Your nearest Baker representative can explain what the Baker Packer Milling Tool can do to help solve your particular needs and how it can be used on a convenient rental service basis.

Bulletin Available on Precision Test Gauge

Illustrated literature describing the new and improved Martin-Decker Precision Test Gauge is now available.

Bulletin M-28A includes accuracy and sensitivity specifications, dial graduation reproductions of available capacities, finish specifications, models available, mounting dimensions and drawings.

The bulletin shows a full size reproduction of the test gauge.

The gauge is available in capacities from 60 psi to 15,000 psi.

A copy of this bulletin may be obtained by writing to: Martin-Decker Corp., 3431 Cherry Ave., Long Beach, Calif.

Fuel Oil Industry To Set Up New Organization

America's fuel oil industry went to work to coordinate research and stimulation of its business on a national scale.

Meeting during the America Petroleum Institute's 39th Annual Meeting in Chicago on Nov. 9, the API Fuel Oil Committee agreed to set up a new industry organization to represent all segments of the fuel oil and oil heating industry.

The committee agreed to ask the Oil Heating Institute, the National Fuel-oil Council and the API Research Activity to create an organization committee with the aim of having a functional group launched by early 1960.

The new organization, the committee agreed, will concentrate on three objectives: improving the selling and servicing of heating oil and burner equipment, creating a better image of heating oil in competition with natural gas, and research to develop a new, low-cost oil burner to compete more effectively with gas burners.

The committee said the new organization would be headed by a 60-man board of directors equally representing dealers, manufacturers, and refiners. The committee said it will have a managing director with staff and that each of the three program functions would have a director and a 30-man industry advisory committee.

The committee said that as a result of this step "the fuel oil and oil heating industry will present a strong, united front for the first time."

Advance Develops New Tong Actuator

A recent development in well servicing technique utilizes air pressure to push power tongs into place around the tubing and to pull them back out of the way when not in use.

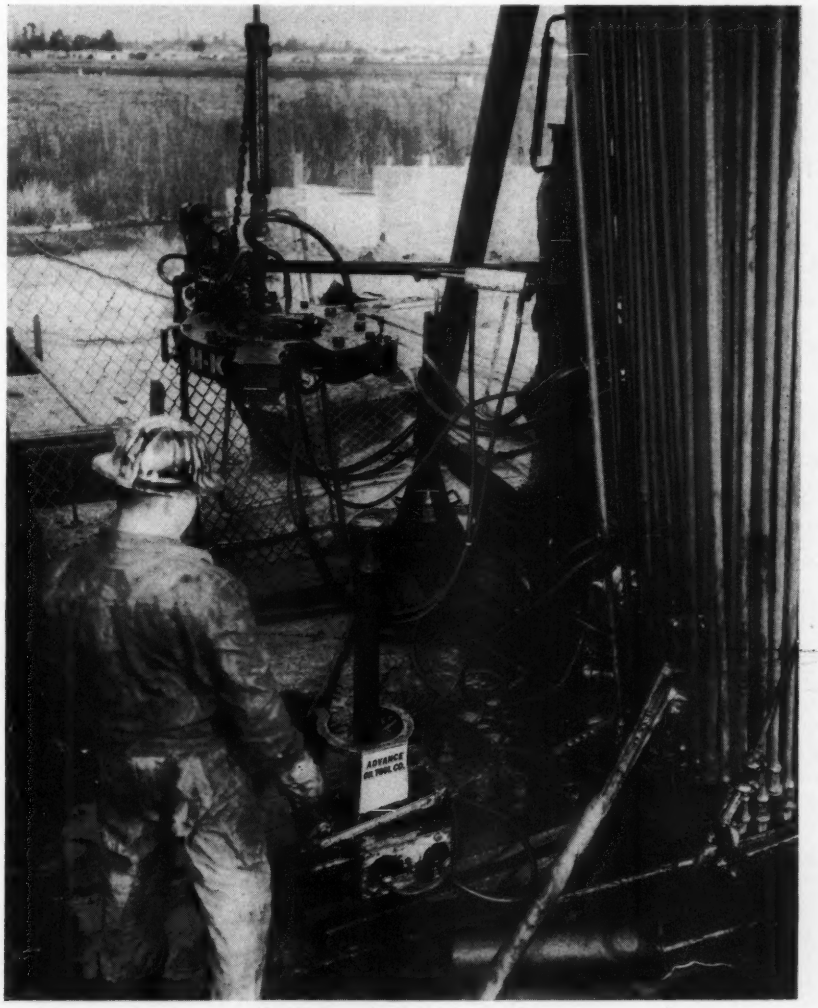
The system illustrated consists of an upright member attached to the mast leg. A bar extends at right angles from this upright member to the tong handle. The bar is slidably mounted on, and connected to, the upright member with a trailer hitch to permit pivoting. It is also connected to the tong handle with a trailer hitch.

An air cylinder is mounted to the mast end of the horizontal bar so as to pivot on its base. The piston rod is also pivotally connected to the bar. Air pressure is supplied to the cylinder through a foot valve and hoses from the same regulator used for the air slips. This pressure is normally 35-40 psi and is sufficient for good operation.

There are several variations from the method illustrated. One system uses an air cylinder vertically mounted on the mast leg, with the piston rod pointing up. A line is attached to the piston rod and is led up and over a sheave, thence down and under another sheave, thence down and under another sheath, thence horizontally to the tong handle.

For the installation illustrated, standard stock cylinders, foot valves, hoses, and connections are used. Because of the many variations in hoist dimensions and design, the rest of the assembly should be done locally by someone capable of good fabrication.

Acknowledgment is made to the personnel of Advance Oil Tool Co., Long Beach, for their assistance in this development.



New tong actuator in operation

NEW LITERATURE

Centennial Edition Available of Petroleum Facts and Figures

Publication of the Centennial edition of "Petroleum Facts and Figures" has been announced by the American Petroleum Institute.

The 475-page volume, prepared by the Institute's Committee on Public Affairs, provides a comprehensive statistical history of the 100-year-old oil industry, including data on production, refining, transportation, marketing and utilization.

The new edition is being issued in conjunction with the anniversary of the drilling of the world's first successful oil well at Titusville, Pa., in 1859. It incorporates for the first time historical highlights on each of the industry's major divisions, a glossary of important terms, and a bibliography.

Members of the API will receive copies without charge. The price to others is $4.50 a copy.

Announce Joint Program for Exploration in Australia

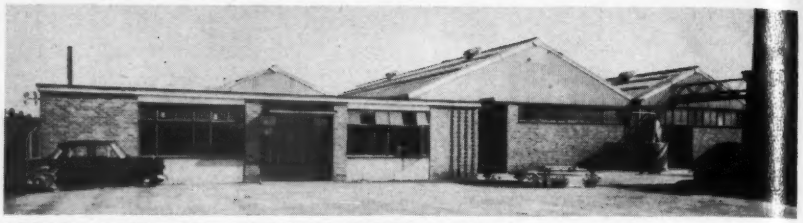
Union Oil Company and the Kern County Land Company today announced a joint program of exploration for oil and gas in a 60,000 square mile area of southwestern Queensland and northern New South Wales in Australia.

The two U. S. companies have arranged with Australian Oil & Gas Corporation Limited of Sydney to carry out an extensive exploration program on land held by the Australian corporation.

Geological studies and geophysical work will be carried out preparatory to selecting a site for a deep test well to be drilled in 1960.

Under terms of the arrangement, Union Development Company, a wholly owned subsidiary of Union Oil Company, and Kern County Land Company will jointly conduct and finance the program.

Union Development will act as manager-operator for the group, providing technical supervision and direction of the program. Australian Oil & Gas will provide administrative services and staff to the joint project and will receive 20% of the profits from any production of oil and gas resulting from the venture.



OFFICES OF THE NEW PETROLITE LIMITED PLANT near Liverpool, England, will be housed in the building at the left. To the right are two buildings which will house part of the plant's operational facilities. Completion of plant is scheduled January 1, 1960.

PERSONALITIES

Honolulu Oil Announces Promotion

Honolulu Oil Corporation announces the promotion of **Robert M. Dewar** to assistant manager of Field Operations, Development and Production, in its Western Division field office at Taft, California. In this new capacity Dewar will direct the Division's drilling, development and producing operations under **H. M. Van Clief,** manager of Field Operations, Western Division.

Dewar joined the Company early in 1937. He has long been active in the Company's producing operations in the lower San Joaquin Valley.

C. F. Meacham, assistant manager of Field Operations, Construction and Services, will continue to be responsible for these activities in the Western Division.

J. T. Llewellyn, has been named manager of exploration, western division, Honolulu Oil Corp. **W. L. Matjasic** was appointed division geophysicist, and **L. E. Redwine** and **C. Webster,** district geologists. It was also announced that the division exploration department was consolidated in newly designated exploration headquarters at the company's Bakersfield office.

Summary of California Oilfield Operations, September 1959

During September, the total production of Crude Oil is estimated to have been 25,211,310 barrels, a daily average of 840,377 barrels. This is a decrease of 1,071 barrels under August, 1959.

Total stocks of crude oil and all other products in District Five decreased 2, 749,000 barrels during the month. Total stocks at the end of September were 123,081,000 barrels. The total stock decrease for the year, up to September 30th, was 12,664,000 barrels. Inventories held in Alaska are included with 1959 figures below, the September stocks being shown in parentheses. Crude oil production in Alaska during September amounted to 2,600 barrels daily.

There were 63 new oil wells, with an initial daily production of 9,355 barrels, 8 gas, and 5 service wells completed during September. This compares with 76 new oil, 10 gas, and 10 service wells completed during August.

STOCKS HELD IN DISTRICT FIVE BY CALIFORNIA OIL COMPANIES
(Excluding Stocks at Service Stations and some Sales Distributing Stations)
(Thousands of 42 Gallons Barrels)

	September 30, 1959 Total	Inc. Alaska	Aug. 31, 1959	Sept. Changes	Sept. 30, 1958
1. Crude Petroleum	34,249	(8)	35,665	—1,416	40,846
2. Condensate, Natural Gasoline, LPG & LRG	1,421	...	1,404	+ 17	1,677
3. Gasoline (Inc. Unfinished)	25,209*	(301)	26,609*	—1,400	23,338
4. Jet Fuel	1,565	(18)	1,587	— 22	1,720
5. Kerosene	342	(12)	401	— 59	299
6. Distillate Fuel Oil	15,299	(484)	14,802	+ 497	14,135
7. Residual Fuel Oil	26,321	(86)	26,994	— 673	33,638
8. Cracking Stocks	10,651	...	10,177	+ 474	13,840
9. All Other Stocks	8,024	(6)	8,191	— 167	7,364
Total	123,081	(915)	125,830	—2,749	136,857
* Includes Unfin. Gasoline Content of Naphtha Dist.	2,399		2.424		2,579

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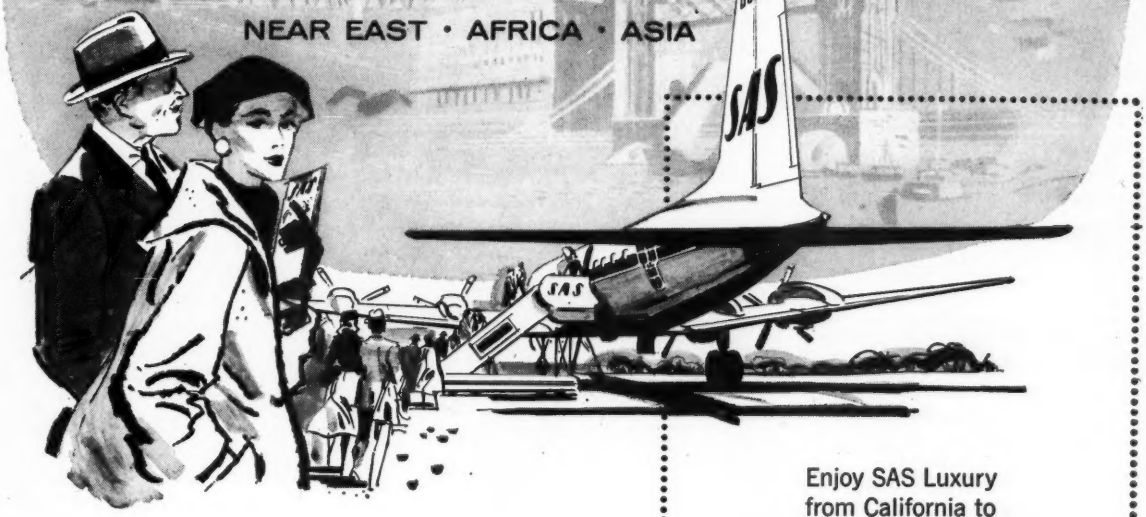

Though there are a dozen airlines to Europe, passengers by actual count make SAS one of the "Big 3" to the Continent. And . . . SAS flies the direct polar route from California to Europe . . . to all the Near East and Africa.

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LOS ANGELES BASIN

Beverly Hills Test Spuds

Allen Guiberson is drilling below 3500 feet on Beverly Hills High School No. 1 located on the Beverly Hills High School grounds in the northwest quarter of Section 25-1s-15w. The location is immediately east of Universal Consolidated Oil Company drill sites on the 20th Century Studio property. The test will be drilled to approximately 8000 feet.

Saugus Test Abandoned

After running logs and sidewall sampling Union Oil Company abandoned N.L. & F. No. B-5 at a total depth of 10,617 feet. The test was located 1200 feet east of production in the southeast quarter of Section 15-4n-16w.

Riverside County Well Deepens

In the Prado Dam area, Macrate Oil Company, Operator and Prado Basin Oil Company are moving in drilling equipment to deepen Macrate GG No. 1 from its present depth of 3613 feet to 4230 feet for a test of the Yorba Sand. Located in Section 20-3s-7w, the test was originally drilled and completed by Lyle Garner as a new field discovery in 1957 pumping 112 b/d of 25 gravity clean oil and later went to water.

Sansinena Completion

Union Oil Company completed Well No. 5B-86 flowing 700 b/d of 29 gravity oil cutting 5.6 per cent through a 37/64" bean and 717 mcf gas. The well was drilled to a total depth of 5717 feet and has 7" casing with perforations from 2183-5170 feet landed at 5710 feet and cemented through ports at 3174 and 2171 feet. Surface location of the well is in southeast quarter of Section 30-2s-10w.

Inglewood Field Test

Grover Collins of Bakersfield is surveying a location for Merchants No. 7 to be drilled on the Applegate property in Section 8-2s-14w.

San Bernardino County Test Abandoned

Euclid Petroleum Company abandoned Euclid No. 2, without testing, at a total depth of 2050 feet. The well was located near Chino in the northwest quarter of Section 7-3s-7w.

Two New Cheviot Hills Tests

Signal Oil and Gas Company has staked locations for two new wells in the field. Signal-Richfield-Hillcrest No. 4 well will be drilled near the intersection of Pico Blvd. and Peg Place in Section 25-1s-15w and Signal-Richfield-Rancho No. 7 near the intersection of Pico Blvd. and Kerwood Street in Section 36-1s-15w.

Orange County Test

In the Richfield area, Hathaway Company is grading location for Blattner No. 4 near the intersection of Yorba Linda and Jefferson Streets in Section 28-3s-9w.

Culver City Well Testing

Continental Oil Company reached a total depth of 11,128 feet on MGM No. 1 and is plugging and testing in stages. Results of the tests are not being released at the present time.

The tests are being run under very unfavorable conditions. Due to the surrounding homes and businesses, it is impossible to allow any mud, gas or oil to escape. All the Operator can do is to allow the drill pipe to fill and then pull the tester.

The well is located near Overland and Montana Streets in Section 12-2s-15w and has 7" casing cemented at 9636 feet.

SAN JOAQUIN VALLEY

North Tejon Completion

Reserve Oil and Gas Company completed BW-SP No. 378-17 flowing 1450 b/d of 34.7 gravity, and cutting 0.1 per cent. Flow was through a 18/64" bean with a flow pressure of 1175 psi. Gas was gauged at 698 mcf. The well, a most easterly completion, was drilled to a total depth of 12,140 feet and cemented 7" casing at 11,690 feet. A 5½" liner perforated from 11,699-11,774 and 11,834-12,140 feet is landed at 12,140 feet. The well is located in the southeast quarter of Section 17-11n-19w.

San Emidio Nose Completion

Richfield Oil Corporation completed KCL-H No. 83-8 flowing 445 b/d of 30.6 gravity oil, cutting 4 per cent and 100 mcf gas. Flow was through a 1½" bean. Located in the northeast quarter of Section 8-11n-21w, two locations south of production, the well was drilled to a total depth of 11,892 feet and cemented 7" casing at 11,498 feet. A 5½" liner perforated from 11,502-11,543 feet was landed at 11,543 feet.

Belgian Anticline Well Deepening

Getty Oil Company resumed operations on Midway-McKittrick No. 53A-30 and is deepening at 5240 feet. Located in the northeast quarter of Section 30-30s-22e the well was first completed in 1951 at a total depth of 5003 feet.

Buena Vista Completion

Standard Oil Company completed well No. 552-29B flowing 175 b/d of 26.4 gravity oil, cutting 3.8 per cent. Flow was through a 21/64" bean with pressures of 60/450 psi. Gas was gauged at 34 mcf. Located in the northeast quarter of Section 29-31s-23e, the well was drilled to a total depth of 5676 feet and plugged back to 5661 feet. 7" casing is cemented at 5094 feet

and 5½" perforated liner hung at 5659 feet.

Mountain View Completion

Kenneth H. Hunter, Jr., Ltd., completed Hunter-Brite No. 1 flowing 424 b/d of 33.7 gravity oil, cutting 1.4 per cent mud and silt, no free water. Flow was through an 18/64" bean with the gas gauged at 350 mcf. The well, a possible new fault block discovery, was drilled to a total depth of 8449 feet and landed 5½" casing with perforations from 8264-8444 feet, at 8444 feet. Casing was cemented through ports at 8246 feet. The well is located in the southeast quarter of Section 16-31s-29e.

North Bellevue Test Abandoned

Humble Oil & Refining Company abandoned Sledge No. 2, an outpost test of the field, at a total depth of 7375 feet. The well was located in the northwest quarter of Section 35-29s-26e, one location south of Sledge No. 1 completed as a new pool discovery.

Sebastian Area Wildcat

Standard Oil Company has staked a location for Union-S.P. No. 56 in the southeast quarter of Section 9-11n-19w. The location is approximately 1500 feet northeast of its Universal Consolidated S.P. No. 338-9 which produced a small amount of oil from 7852-7967 and 8188-8354 feet.

San Emidio Test Abandoned

Texaco Inc. abandoned KCL-San Emidio No. 2 at a total depth of 13,099 feet. There were no tests made on the well located in the southeast quarter of Section 18-11n-21w, two miles southwest of the San Emidio Nose Field.

North Mount Poso Test Abandoned

Three and one-half miles southeast of the Jasmin production, Ted Sterling, Operator, abandoned Standard-Carver No. 1 at a total depth of 1735 feet. An electric log was run and 19 sidewall samples taken. The test was located in the northwest quarter of Section 29-25s-28e.

Two Trico Gas Field Completions

Trico Oil and Gas Company completed two gas producers in the field, Daniel No. 18 located in the southwest quarter of Section 22-24s-23e flowing 1800 mcf gas per day from the interval 2484-2496 feet through a 38/64" bean with pressures of 640/640 psi. The well was drilled to a total depth of 2515 feet and cemented 4½" casing at 2512 feet. Union-Seymour No. 4 located in the southwest quarter of Section 20-24s-23e was drilled to a total depth of 2580 feet and cemented 4½" casing at 2559 feet. The casing was perforated from 2478-2486 feet and the well completed flowing 1500 mcf per day with pressures of 680/680 psi.

Trico Oil and Gas Company's Newland No. 6 located in the southwest quarter of Section 21-24s-23e is drilling below 1250 feet.

North Tejon Completion

Richfield Oil Corporation completed KCL-I No. 52-24 flowing 542 b/d of 37 gravity oil, cutting 6 per cent through a 1" bean with pressures of 250/0 psi. The well was drilled to a total depth of 11,662 feet and plugged back to 11,430 feet. 7" casing is cemented at 11,085 feet and jet perforated from 8880-9055 feet. A 5½" perforated liner is hung at 11,428 feet and 2½" tubing with a packer at 8722 feet is hung at 11,021 feet. Location of the well is in the northeast quarter of Section 24-11n-20w.

Wheeler Ridge Completion

Richfield Oil Corporation completed ROCO-M.J.M.&M.-Banks No. 56-30 flowing 130 b/d of 59 gravity oil, cutting 0.5 per cent through a 15/64" bean with a flow pressure of 2275 psi. Gas was gauged at 2700 mcf. The well reached a total depth of 8744 feet and cemented 7" casing at 8654 feet. A 5½" liner perforated from 8658-8702 feet is hung at 8470 feet. Location of the well is in the southeast quarter of Section 30-11n-19w.

Buena Vista Well Suspended

Kern Oil California Limited suspended operations on Well Unit A No. 53 after deepening from 5230 feet to 6842 feet. A formation test of the interval 6730-6842 feet recovered water with a trace of oil. Location of the well is in the northeast quarter of Section 16-32s-24e.

Vallecitos Field Test

Shell Oil Company has staked a location for F and I No. 49-31, a field well, in the southwest quarter of Section 31-16s-11e.

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San Emidio Nose Test

Richfield Oil Corporation is grading location for KCL-H No. 25-9 in the southwest quarter of Section 9-11n-21w.

Madera County Test Abandoned

Four miles northwest of the Gill Ranch Gas Field, Imperial Development Company Ltd. abandoned Imperial-Union No. 1 at a total depth of 5050 feet. The test was located in the northwest quarter of Section 34-12s-15e.

NORTHERN CALIFORNIA

Sacramento County Test Abandoned

Petan Company abandoned its Walnut Grove area test, Gwerder No. 1 at a total depth of 8080 feet. Located in the southeast quarter of Section 17-11n-19w the well was originally abandoned at a total depth of 5500 feet. Several unsuccessful tests were made after deepening to 8080 feet.

Vernalis Area Development

Great Basins Petroleum Company has signed a 20-year contract with the Pacific Gas and Electric Co. for the delivery of gas from the Vernalis Field. Price agreed upon was 26 cents per 1000 cubic feet, with Great Basins to deliver 16,000,000 cubic feet daily during the first five years of the contract terms. Great Basins will start delivering Vernalis gas not later than February 1st. After payment of Vernalis royalties, Great Basins will net between $450,000 and $500,000 a year under the first delivery agreement. Renegotiation of the contract on January 1, 1961, has been provided.

East of Vernalis Gas Field, Great Basins Petroleum Company and Christiana Oil Corporation have staked location for four wildcat tests, two in San Joaquin County and two in Stanislaus County. Schleiss No. 1, a 5300 foot test will be drilled in southeast quarter of Section 30-2s-7e; Wilson No. 1, a 5000 foot test in the southwest quarter of Section 7-2s-8e. The Stanislaus County tests are Walker No. 1, a 5200 foot test, located in the southwest quarter of Section 12-3s-8e and Skiles No. 1, a 5300 foot test located in the southwest quarter of Section 28-2s-8e. Exploration Drilling Company has the contract to drill the four wells.

Two Colusa County Tests

In the Arbuckle area, Occidental Petroleum Corporation is grading location and rig sites for two new tests. Arbuckle Unit S No. 1 will be drilled near the center of the northwest quarter of Section 4-13n-2w and Arbuckle Unit M No. 1 in the northwest quarter of Section 33-14n-2w.

Grimes Area Wildcat

Cameron Oil Company is grading location for a wildcat gas test ten miles northeast of the Arbuckle Gas Field. The well, Cameron-Armstrong No. 1, will be drilled in the northeast quarter of Section 7-14n-1e.

Texaco Test Abandoned

In the Vacaville area, Solano County, Texaco Inc. abandoned English Creek Core Hole No. 3 at a total depth of 4500 feet. The test was located in the southwest quarter of Section 32-7n-1w.

Arbuckle Well Completing

Occidental Petroleum Corporation's Arbuckle Unit X No. 1 is gun perforating the 5½" casing for a production test after two successful open hole tests. The Upper C sand tested at 4460 mcf and the Main C sand at 6820 mcf. The Upper Wiggins and the E sands were not tested. The Mathews sand was not present. The well, located in the northwest quarter of Section 34-14n-2w was drilled to a total depth of 6700 feet and cemented 5½" casing at 6669 feet.

Yolo County Test

In the Capay Canal area, Rinde Oil Company is drilling below 2000 feet on Griffin No. 1, located in the southeast quarter of Section 29-9n-1w. The test will be drilled to approximately 4500 feet and is five miles northwest of the Winters Gas Field.

Solano County Test Abandoned

In the Liberty Cut area, between the Maine Prairie and the Liberty Cut Gas Field, Zephyr Oil Company drilled and cored to a total depth of 6300 feet and abandoned Yolando-Leon No. 1. The test was located in the northeast quarter of Section 7-5n-3e.

Sacramento County Test Abandoned

E. B. Towne abandoned Herzog Company No. 1, after running logs, at a total depth of 8100 feet. The test was located near Stone Lake in the southwest quarter of Section 2-5n-4e, five miles north of the Thornton Gas Field.

San Joaquin County

John M. Young has staked a location for "Well" No. 15-1, a 5500 foot test in the center of the northeast quarter of Section 15-3s-5e, approximately five miles west of the Vernalis Gas Field.

Butte County Completion

In the Durham area Standard Oil Company completed T. W. Rodgers No. 1 flowing 2800 mcf through a 3/8" bean with flow pressure of 816/858 psi. The well was drilled to a total depth of 2270 feet and cemented 5½" casing at 2270 feet. The 5½" casing is gun perforated from 2150-2100 feet. The well is located in the northeast quarter of Section 6-20n-1e.

COASTAL AREA

South Mountain Completion

Calnada Inc. completed C-S No. 1 pumping 175 b/d of 19.5 gravity oil, cutting 0.1 per cent from a total depth of 4465 feet. With 8⅝" casing cemented at 2515 feet a total of 1950 feet of zone is open to production. The well is located in the northeast quarter of Section 17-3n-20w. A location is being prepared for an offset well 300 feet north.

West Montalvo Completion

Standard Oil Company completed Scarlett No. 3 flowing 843 b/d of 15 gravity oil, cutting 4.2 per cent through a 16/64" bean. Pressures were 825/825

psi and gas flow was 238 mcf. The well located in the southwest quarter of Section 31-2n-22w was drilled to a total depth of 11,700 feet and cemented 7″ casing at 11,689 feet. Cement was drilled out to 11,400 feet and the casing jet perforated at intervals from 11,060-10,448 feet.

Saticoy Wildcat Test

Albert Stevenson is preparing to survey a location for a 3000 foot test to be drilled in the northwest quarter of Section 6-2n-21w. The drilling will be contracted.

Ventura County Recompletion

Wm. M. Thornbury, W. H. Geis and K. H. Hunter, after reperforating the 7″ casing from 4892-5225 feet, recompleted King No. 9 flowing 750 b/d of 28 gravity clean oil. The well is located in the Eardsdale Field in Section 1-3n-20w. Total depth of the well is 6400 feet and has 7″ casing cemented at 6114 feet.

Ojai Field Test

Sisar Creek Corporation is preparing to spud Lucas No. 5 located in the southeast quarter of Section 12-4n-22w.

The test will be drilled to about 3000 feet. Fletcher Drilling Company has the contract and Elmer Olson will do the engineering.

OTHER STATES

Alaska

Standard Oil Company and Richfield Oil Corporation's Swanson River Unit No. 12-27 drilled to a total depth of 11,500 feet and is preparing for a production test. 9⅝″ casing is cemented at 7228 feet and 5½″ blank liner cemented at 11,492 feet. The well is located on the Kenai Peninsula in Section 27-8n-9w.

General Petroleum Corporation is preparing to abandon Great Basins No. 2 at a total depth of 8865 feet in basement. The well is located in the Bristol Bay area in Section 35-25s-50w.

Union Oil Company and The Ohio Oil Company reached a total depth of 5809 feet on their Union-Ohio-Kenai Unit No. 34-31 and after running logs are preparing to cement casing and test. The well is located in Section 31-5n-11w, one mile northeast of their gas discovery, the first gas completion in Alaska.

Standard Oil Company and Richfield Oil Corporation are preparing to test Swanson River Unit No. 32-15, located in Section 15-8n-9w. The well was drilled to a total depth of 11,982 feet and has 7″ casing cemented at 11,959 feet and jet perforated 11,400-11,500 feet.

Oregon

Ross R. Mitchell and Associates abandoned Paige No. 1 at a total depth of 600 feet. The shallow test was located in Section 1-8s-5w in Polk County.

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THIS LAUGH OFF!!

Husband to wife: "If we continue to save at our present rate, at retirement we'll owe three hundred thousand dollars."

Two old coon hunters were swapping tall stories about their dogs.

"Why," said one of them, "I had a yaller hound once and every time just before I went hunting I'd whittle out a board in the shape of a coon hide stretcher, just to show him the size of the one I wanted, then I'd set it outside where he could see it. Well, sir, one day my wife set the ironin' board outside and that critter ain't come back yet!"

"Why did you encourage your wife to give up the piano and start playing the clarinet?"

"She can't sing while playing the clarinet."

Narrow roads where two cars could barely pass are being replaced by wide freeways on which six or eight cars can collide at the same time.

The Alabama farmer passed away and the preacher came to the widow to get some information about the man to use in his funeral sermon.

"Was he a Mason, an Elk, a Woodman? Did he belong to the Chamber of Commerce, the Ku Klux Klan?" the preacher asked.

"What's the Ku Klux Klan?" the widow asked.

"Well," the minister replied, "you might say that's the devil under a sheet."

"THAT he was," the widow readily answered.

"Daddy, what is a nudist?"

"A person who goes coatless and vestless, with trousers to match."

An inquiring reporter was making the rounds of the cracker barrel set in a New Hampshire grocery. He asked one old fellow: "Can you remember the first girl you ever kissed?"

The old man laughed, "I can't even remember the last one."

Fragment of conversation: "Do you think the psychiatrist helped her?"

"Yes, I do. Do you know what he told her? He said, 'No one in this world needs a mink coat but a mink.'"

Joe—"My uncle tried to make a new kind of a car. He took wheels from a Cadillac, radiator from a Ford, rear lights from a Plymouth—"

Frank—"What did he get?"

Joe—"Two years."

A divorcee threatened her ex-husband, "If you miss a single alimony payment, I'll repossess you!"

A three-year-old was struggling with the back button on his long underwear. Finally, he gave up, trotted to his mother and said: "Mummy, open my bathroom door, please."

"Did you get home all right last night, sir?" said the bus driver to one of his regular passengers.

"Of course. Why do you ask?"

"Well, when you got up and gave the lady your seat last night, you were the only two passengers on the bus."

Then there's the story of a drunk who sauntered into a railway ticket agency and plunked down $20.00. "Gimmie," he hiccoughed, "a ticket to Walla Walla." "Sorry," said the clerk, "but the fare to Walla Walla is $40.00." The soak nodded. "Well, then," he drooled, "Gimmie a ticket to Walla."

Keep smiling. It makes everyone wonder what you've been up to.

To err is human, but when the eraser wears out before the pencil, you're overdoing it.

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For clean out work and small junk. Self-loading and self-dumping it is the fastest tool on a wire line.

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Continuous dumping of cement or chemicals. Has no ports or sleeves to foul.

Cavins Bridging Plug
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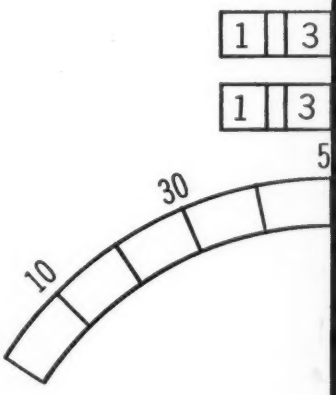
Santa Maria: 1767 Broadway, WAlnut 5-8711
Ventura: 1641 N. Venture Ave., Miller 3-6767
Bakersfield: 130 E. Norris Road, EXport 9-3605

McCullough Magna-Tector is the key tool in stuck pipe recovery. It tells *exactly* where pipe is stuck and accurately locates the lowest free point from which it may be recovered—all this in a matter of minutes after the Magna-Tector is run in the well.

This super-sensitive, electronic-magnetic instrument will record even the slightest movement in a stuck string of pipe at any depth—movement of the stuck string at the testing depth means free pipe—lack of movement means stuck pipe. And this tool is so accurate it will electronically record movement as little as the thickness of a human hair



Thus the Magna-Tector paves the way for immediate recovery of *all* free pipe and minimizes the fishing job for remaining stuck sections. It is equally effective in drill pipe, drill collars, tubing or casing.

After the lowest free point has been determined, actual free pipe recovery is accomplished by a McCullough String Shot Back-off, Chemical Tubing Cutter or Jet Casing Cutter.

These companion tools, used with the Magna-Tector, form an unbeatable team for efficient, economical free pipe recovery.

TELLS EXACT DEPTH
OF LOWEST FREE POINT
IN STUCK PIPE

McCULLOUGH
MAGNA-TECTOR
(FREE POINT FINDER)

McCullough *TOOL COMPANY*

LOS ANGELES • HOUSTON • EDMONTON *Cable Address:* MACTOOL

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